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Chapter 42: Respiratory Tract Infections, Upper

ACUTE OTITIS MEDIA

- *Definition: Otitis media* is an inflammation of the middle ear that is most common in infants and children. There are three subtypes of otitis media: acute otitis media, otitis media with effusion, and chronic otitis media.
- Bacteria have been found in more than 80% of cases of otitis media. Common bacterial pathogens include *Streptococcus pneumoniae*, nontypeable *Haemophilus influenzae*, and *Moraxella catarrhalis*.

CLINICAL PRESENTATION

- Acute otitis media in children is characterized by acute onset of otalgia (ear pain). Symptoms include irritability, fever (typically low grade), sleep disturbance, hearing difficulties, and ear tugging.
- Children should be diagnosed with acute otitis media if they have middle ear effusion and either (1) moderate-to-severe bulging of the tympanic membrane or new-onset otorrhea not due to acute otitis externa or (2) mild bulging of the tympanic membrane and onset of ear pain within the last 48 hours or intense erythema of the tympanic membrane.
- In older children and adults, the primary symptoms are ear pain, feeling of fullness or pressure in the ear, hearing impairment, fluid drainage if eardrum ruptures, vertigo, nystagmus, and tinnitus.

TREATMENT

- Goals of Treatment: Pain management and prudent antibiotic use. Acute otitis media should first be differentiated from otitis media with effusion or chronic otitis media.
- Primary prevention of acute otitis media with pneumococcal conjugate vaccine and annual influenza vaccine is recommended for all children.
- Pain of otitis media should be addressed with oral analgesics. **Acetaminophen** or a nonsteroidal anti-inflammatory agent, such as **ibuprofen,** should be offered early to relieve pain of acute otitis media.
- Antibiotic therapy should be initiated for children 6 months and older with acute otitis media showing severe symptoms (ie, toxic-appearing, persistent ear pain lasting more than 48 hours, or temperature of 39°C [102.2°F] or higher), for children 6 months and older with acute otitis media with otorrhea, and for children 6–23 months of age with bilateral acute otitis media. Also, adults with acute otitis media should receive antibiotic therapy due to limited data on safety of withholding antibiotics.
- Observation without initial antibiotic treatment can be considered for children 6 months and older with nonsevere unilateral acute otitis media without otorrhea and children 24 months and older with bilateral acute otitis media without otorrhea.
- The central principle is to administer antibiotics quickly when the diagnosis is certain, but to withhold antibiotics, at least initially, when the diagnosis is uncertain.
- High-dose **amoxicillin** (80–90 mg/kg/day in two divided doses) is recommended for most children. Children who have received amoxicillin in the last 30 days, have concurrent purulent conjunctivitis, or have a history of recurrent infection unresponsive to amoxicillin should receive high-dose **amoxicillin–clavulanate** (90 mg/kg/day of amoxicillin, with 6.4 mg/kg/day of clavulanate, in two divided doses) instead of amoxicillin.
- Antibiotic treatment recommendations for acute otitis media are given in **Table 42-1**.

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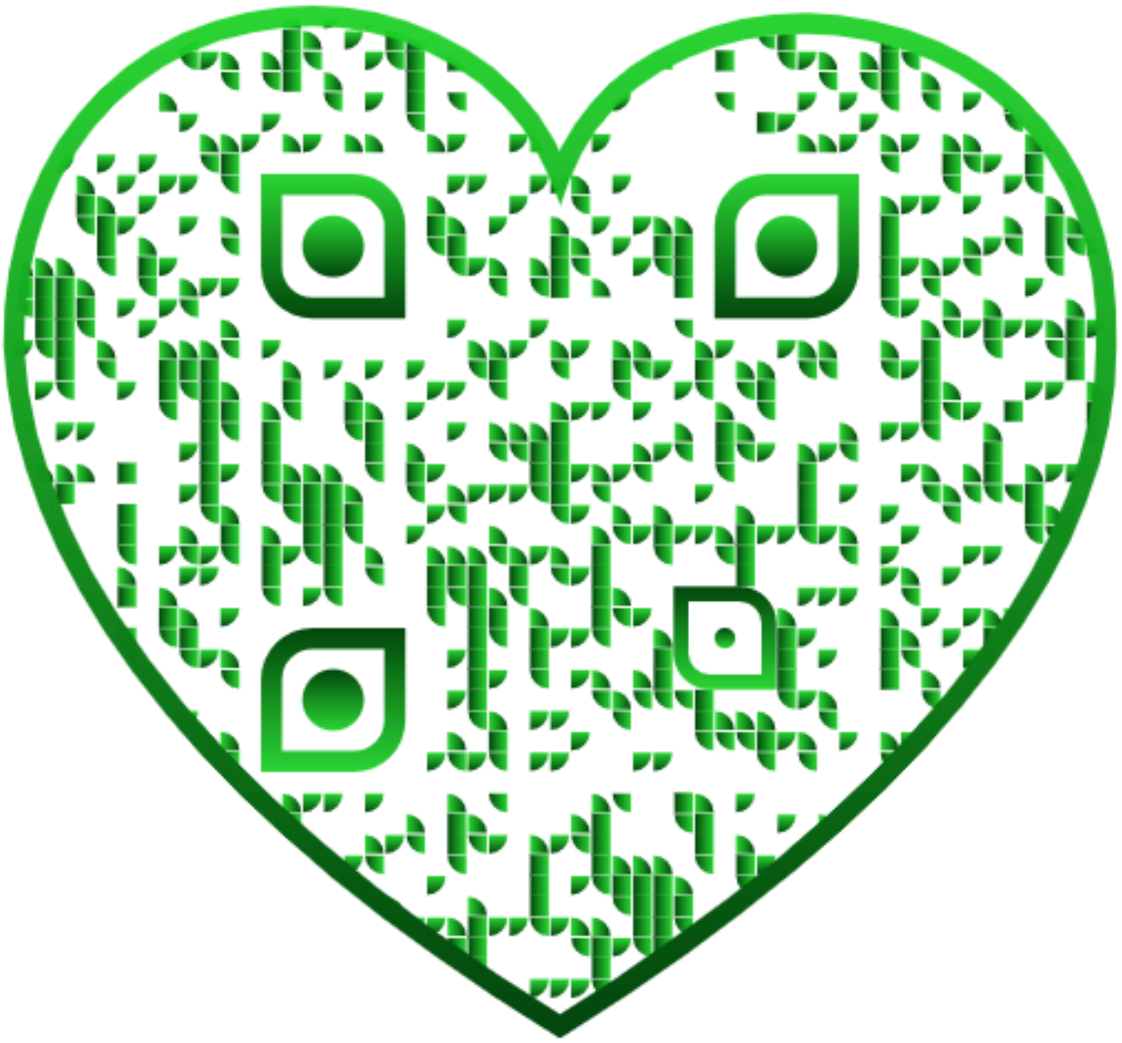

- In most adults, the first-line treatment is amoxicillin–clavulanate 875 mg with clavulanate 125 mg orally twice daily.
- Patients with a penicillin allergy can be treated with several alternative antibiotics, including a cephalosporin in patients without history of severe or type 1 penicillin allergy.
- In children at least 6 years old who have mild-to-moderate acute otitis media, a 5- to 7-day course of antibiotics may be used. Short-course treatment is not recommended in children younger than 2 years of age.
- Patients with acute otitis media should be reassessed after 48–72 hours. A switch in regimen is recommended if there is no clinical improvement by the third day of therapy.

TABLE 42-1

Antibiotics and Doses for Acute Otitis Media

Antibiotic	Brand Name	Dose	Comments[a]
Initial Diagnosis			
Amoxicillin	Amoxil	80–90 mg/kg/day orally divided twice daily	First line
Amoxicillin–clavulanate	Augmentin	90 mg/kg/day orally of amoxicillin plus 6.4 mg/kg/day orally of clavulanate, divided twice daily	First line if certain criteria are present[b]
Cefdinir, cefuroxime, cefpodoxime	Omnicef, Ceftin, Vantin	Cefdinir (14 mg/kg/day orally in 1–2 doses), cefuroxime (30 mg/kg/day orally in two divided doses), cefpodoxime (10 mg/kg/day orally in two divided doses)	Second line or nonsevere penicillin allergy
Ceftriaxone	Rocephin	50 mg/kg/day IM or IV for 3 days	Second line or nonsevere penicillin allergy
Failure at 48–72 Hours			
Amoxicillin–clavulanate[b]	Augmentin	90 mg/kg/day orally of amoxicillin plus 6.4 mg/kg/day orally of clavulanate, divided twice daily	First line
Ceftriaxone	Rocephin	50 mg/kg/day IM or IV for 3 days	First line or nonsevere penicillin allergy

IM, intramuscular; IV, intravenous.

[a]Amoxicillin–clavulanate 90:6.4 or 14:1 ratio is available in the United States; 7:1 ratio is available in Canada (use amoxicillin 45 mg/kg for one dose, amoxicillin 45 mg/kg with clavulanate 6.4 mg/kg for second dose).

[b]If a patient has received amoxicillin in the last 30 days, has concurrent purulent conjunctivitis, or has a history of recurrent infection unresponsive to amoxicillin.

ACUTE PHARYNGITIS

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- *Definition: Pharyngitis* is an acute infection of the oropharynx or nasopharynx that is responsible for 6% of visits by children to their primary care provider annually. Although viral causes are most common, group A β-hemolytic *Streptococcus* (GAS, also known as *Streptococcus* pyogenes) is the primary bacterial cause.
- Viruses (eg, rhinovirus, coronavirus, adenovirus, and herpes simplex virus) cause most of the cases of acute pharyngitis. Of all the bacterial causes, GAS is the most common (10%–30% of cases in pediatric patients and 5%–15% in adults).
- Suppurative and nonsuppurative complications include acute rheumatic fever, acute glomerulonephritis, reactive arthritis, peritonsillar abscess, retropharyngeal abscess, cervical lymphadenitis, mastoiditis, otitis media, rhinosinusitis, and necrotizing fasciitis.

CLINICAL PRESENTATION

- The most common symptom of pharyngitis is sore throat of sudden onset that is mostly self-limited.
- Fever and constitutional symptoms resolve in about 3–5 days.
- Signs and symptoms of GAS pharyngitis include sore throat; pain on swallowing; fever; headache; nausea; vomiting; and abdominal pain (especially in children); erythema/inflammation of the tonsils and pharynx with or without patchy exudates; enlarged, tender lymph nodes; red swollen uvula; petechiae on the soft palate; and a scarlatiniform rash.
- Signs suggestive of viral origin for pharyngitis include conjunctivitis, coryza, cough, anterior stomatitis, and viral exanthem.
- Diagnosis can be confirmed by throat swab and culture and a rapid antigen-detection test.

TREATMENT

- Goals of Treatment: Improve clinical signs and symptoms, minimize adverse drug reactions, prevent transmission to close contacts, and prevent acute rheumatic fever and suppurative complications such as peritonsillar abscess, cervical lymphadenitis, and mastoiditis.
- Antimicrobial therapy should be limited to those who have clinical and epidemiologic features of GAS pharyngitis, preferably with a positive laboratory test.
- Because pain is often the primary reason for visiting a physician, emphasis on analgesics such as **acetaminophen** and nonsteroidal anti-inflammatory drugs to aid in pain relief is strongly recommended.
- **Penicillin** and **amoxicillin** are the treatments of choice; however, amoxicillin suspension is more palatable. Antimicrobial treatment should be limited to those who have clinical and epidemiologic features of GAS pharyngitis with a positive laboratory test (**Table 42-2**). **Table 42-3** presents antibiotics and doses for eradication of GAS in chronic carriers. The duration of therapy for GAS pharyngitis is 10 days, except for **benzathine penicillin** and **azithromycin.**
- In patients with nonanaphylactic penicillin allergy, a first-generation cephalosporin such as cephalexin is recommended for 10 days.
- **Amoxicillin–clavulanate**, **clindamycin**, **penicillin/rifampin** combination, and **benzathine penicillin G/rifampin** combination may be considered for recurrent episodes of pharyngitis to maximize bacterial eradication in potential carriers and to counter copathogens that produce β-lactamases.
- Most cases of pharyngitis are self-limited; however, antimicrobial therapy will hasten resolution when given early to proven cases of GAS. Symptoms generally resolve by 3 or 4 days even without antibiotics; however, symptoms will improve 0.5–2.5 days earlier with antibiotic therapy. Follow-up testing is generally not necessary for index cases or in asymptomatic contacts of the index patient; however, throat cultures 2–7 days after completion of antibiotics are warranted for patients who remain symptomatic or when symptoms recur despite completion of treatment.

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TABLE 42-2

Antibiotics and Doses for Group A β-Hemolytic Streptococcal Pharyngitis

Antibiotic	Brand Name	Dose	Route/Duration	Rating
Preferred Antibiotics If No Penicillin Allergy				
Penicillin V	Pen-V	Children: 250 mg twice daily or three times daily orally; adult: 250 mg four times daily or 500 mg twice daily orally	Orally 10 days	IB
Penicillin G benzathine	Bicillin L-A	<27 kg: 0.6 million units; 27 kg or greater: 1.2 million units IM	IM one dose	IB
Amoxicillin[a]	Amoxil	50 mg/kg once daily (maximum 1000 mg); 25 mg/kg (maximum 500 mg) twice daily	Orally 10 days	IB
Penicillin Allergy				
Cephalexin	Keflex	20 mg/kg/dose orally twice daily (maximum 500 mg/dose)	Orally 10 days	IB
Cefadroxil	Duricef	30 mg/kg orally once daily (maximum 1 g)	Orally 10 days	IB
Clindamycin	Cleocin	7 mg/kg/dose orally thrice daily (maximum 300 mg/dose)	Orally 10 days	IIaB
Azithromycin[b]	Zithromax	12 mg/kg orally once daily (maximum 500 mg) for 1 day, then 6 mg/kg orally once daily (maximum 250 mg) for 4 days	Orally 5 days	IIaB
Clarithromycin[b]	Biaxin	15 mg/kg orally per day divided in two doses (maximum 250 mg twice daily)	Orally 10 days	IIaB

IM, intramuscularly.

[a]Standard formulation, not extended release.

[b]Resistance of group A β-hemolytic *Streptococcus* (GAS) to these agents may vary and local susceptibilities should be considered with these agents.

These guidelines provide a systematic weighting of the strength of the recommendation (Class I, conditions for which there is evidence and/or general agreement that a given procedure or treatment is beneficial, useful, and effective; Class II, conditions for which there is conflicting evidence and/or a divergence of opinion about the usefulness/efficacy of a procedure or treatment; Class IIa, weight of evidence/opinion is in favor of usefulness/efficacy; Class IIb, usefulness/efficacy is less well established by evidence/opinion; Class III, conditions for which there is evidence and/or general agreement that a procedure/treatment is not useful/effective and in some cases may be harmful) and quality of evidence (A, data derived from multiple randomized clinical trials or meta-analyses; B, data derived from a single-randomized trial or nonrandomized studies; C, only consensus opinion of experts, case studies, or standard of care).

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TABLE 42-3

Antibiotics and Doses for Eradication of Group A β-Hemolytic Streptococcal Pharyngitis in Chronic Carriers

Antibiotic	Brand Name	Dose
Clindamycin	Cleocin	20–30 mg/kg/day orally in three divided doses (maximum 300 mg/dose) for 10 days
Amoxicillin–clavulanate	Augmentin	40 mg/kg/day orally in three divided doses (maximum 2000 mg/day of amoxicillin) for 10 days
Penicillin V and rifampin	Pen-V, Rifadin	Penicillin V: 50 mg/kg/day orally in four doses for 10 days (maximum 2000 mg/day); *and* rifampin: 20 mg/kg/day orally in one dose for the last 4 days of treatment (maximum 600 mg/day)
Penicillin G benzathine and rifampin	Bicillin L-A, Rifadin	Penicillin G benzathine: <27 kg–0.6 million units IM once; 27 kg or greater: 1.2 million units IM; *and* rifampin: 20 mg/kg/day orally in two doses during last 4 days of treatment with penicillin (maximum 600 mg/day)

IM, intramuscularly.

ACUTE BACTERIAL RHINOSINUSITIS

- *Definition: Sinusitis* is an inflammation and/or infection of the paranasal sinuses, or membrane-lined air spaces, around the nose. The term *rhinosinusitis* is preferred, because sinusitis typically also involves the nasal mucosa. The majority of these infections are viral in origin. It is important to differentiate between viral and bacterial sinusitis to aid in optimizing treatment decisions.
- Acute bacterial sinusitis is most often caused by the same bacteria implicated in acute otitis media: *S. pneumoniae*, nontypeable *H. influenzae*, and *M. catarrhalis.* These organisms are responsible for ~50%–70% of bacterial causes of acute sinusitis in both adults and children.

CLINICAL PRESENTATION

- There are three clinical presentations that are most consistent with acute bacterial versus viral rhinosinusitis: (1) onset with *persistent* signs or symptoms compatible with acute rhinosinusitis, lasting for ≥10 days without any evidence of clinical improvement; (2) onset with severe signs or symptoms of high fever (≥39°C [102.2°F]) and purulent nasal discharge or facial pain lasting for at least 3–4 consecutive days at the beginning of illness; (3) onset with *worsening* signs or symptoms characterized by new-onset fever, headache, or increase in nasal discharge following a typical viral upper respiratory infection that lasted 5–6 days and were initially improving (“double sickening”).
- Signs and symptoms of bacterial rhinosinusitis include purulent anterior nasal discharge, purulent or discolored posterior nasal discharge, nasal congestion or obstruction, facial congestion or fullness, facial pain or pressure, fever, headache, ear pain/pressure/fullness, halitosis, dental pain, cough, and fatigue.
- Viral rhinosinusitis typically improves in 7–10 days. In contrast, acute bacterial rhinosinusitis symptoms persist for 10 days or greater without improvement or with worsening symptoms after 10 days, or can manifest worsening after initial improvement (“double-sickness” pattern).

TREATMENT

- Goals of Treatment: Reducing signs and symptoms, achieving and maintaining patency of the ostia, limiting antimicrobial treatment to those who may benefit, eradicating bacterial infection with appropriate antimicrobial therapy, minimizing the duration of illness, preventing complications, and preventing progression from acute disease to chronic disease.

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- Symptomatic management for acute rhinosinusitis aims to relieve symptoms due to nasal drainage and obstruction such as pain with use of analgesics. Intranasal saline irrigation with either physiologic or hypertonic saline or intranasal corticosteroids are recommended as adjunct to antibiotics therapy in patients with acute bacterial rhinosinusitis, primarily in patients with a history of allergic rhinitis.
- Topical or oral decongestants or antihistamines are generally not recommended as adjunctive treatment for acute bacterial rhinosinusitis. These agents can dry mucosa and disturb clearance of mucosal secretions.
- **Amoxicillin–clavulanate** is recommended by the Infectious Diseases Society of America as first-line treatment in children and adults for acute bacterial rhinosinusitis. See **Tables 42-4** and **42-5**. Alternative guidelines recommend amoxicillin as first-line treatment after watchful waiting for up to 7 days.
- The American Academy of Pediatrics guidelines recommend that after diagnosis, clinicians may observe children for persistent symptoms for an additional 3 days before prescribing antibiotics, but antibiotics should be given immediately for severe or worsening symptoms. The first-line treatment is amoxicillin, with or without clavulanate.
- High-dose amoxicillin–clavulanate (2000 mg twice daily or 90 mg/kg/day twice daily) is recommended in the following situations: (1) geographic regions with high endemic rates (10% or greater) of invasive penicillin-nonsusceptible *S. pneumoniae*, (2) severe infection, (3) attendance at daycare, (4) age less than 2 or greater than 65 years, (5) recent hospitalization, (6) antibiotic use within the last month, and (7) immunocompromised persons. Doxycycline is also second line for adults but should be avoided in children.
- The duration of therapy for the treatment of uncomplicated acute bacterial rhinosinusitis is 5–7 days for most adults. A longer duration of 10–14 days is still recommended for children.
- Intranasal saline irrigation with either physiologic or hypertonic saline, intranasal corticosteroids (primarily in patients with a history of allergic rhinitis) can be used for symptomatic management.

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TABLE 42-4

Antibiotics and Doses for Acute Bacterial Rhinosinusitis in Children

Antibiotic	Brand Name	Dose	Comments
Initial Empirical Therapy			
Amoxicillin–clavulanate	Augmentin	45 mg/kg/day orally twice daily	First line
Amoxicillin–clavulanate	Augmentin	90 mg/kg/day orally twice daily	Second line
β-Lactam Allergy			
Clindamycin plus cefixime or cefpodoxime	Cleocin Suprax, Vantin	Clindamycin (30–40 mg/kg/day orally three times daily) plus cefixime (8 mg/kg/day orally twice daily) or cefpodoxime (10 mg/kg/day orally twice daily)	Nontype 1 allergy
Levofloxacin	Levaquin	10–20 mg/kg/day orally every 12–24 hours	Type 1 allergy
Risk for Antibiotic Resistance or Failed Initial Therapy			
Amoxicillin–clavulanate	Augmentin	90 mg/kg/day orally twice daily	
Clindamycin plus cefixime or cefpodoxime	Cleocin, Suprax, Vantin	Clindamycin (30–40 mg/kg/day orally three times daily) plus cefixime (8 mg/kg/day orally twice daily) or cefpodoxime (10 mg/kg/day orally twice daily)	
Levofloxacin	Levaquin	10–20 mg/kg/day orally every 12–24 hours	
Severe Infection Requiring Hospitalization			
Ampicillin–sulbactam	Unasyn	200–400 mg/kg/day IV every 6 hours	
Ceftriaxone	Rocephin	50 mg/kg/day IV every 12 hours	
Cefotaxime	Claforan	100–200 mg/kg/day IV every 6 hours	
Levofloxacin	Levaquin	10–20 mg/kg/day IV every 12–24 hours	

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TABLE 42-5

Antibiotics and Doses for Acute Bacterial Rhinosinusitis in Adults

Antibiotic	Brand Name	Dose	Comments
Initial Empirical Therapy			
Amoxicillin–clavulanate	Augmentin	500 mg/125 mg orally three times daily, or 875 mg/125 mg orally twice daily	First line
Amoxicillin–clavulanate	Augmentin	2000 mg/125 mg orally twice daily	Second line
Doxycycline		100 mg orally twice daily or 200 mg orally once daily	Second line
β-Lactam Allergy			
Doxycycline		100 mg orally twice daily or 200 mg orally once daily	
Levofloxacin	Levaquin	500 mg orally once daily	
Moxifloxacin	Avelox	400 mg orally once daily	
Risk for Antibiotic Resistance or Failed Initial Therapy			
Amoxicillin–clavulanate	Augmentin	2000 mg/125 mg orally twice daily	
Levofloxacin	Levaquin	500 mg orally once daily	
Moxifloxacin	Avelox	400 mg orally once daily	
Severe Infection Requiring Hospitalization			
Ampicillin–sulbactam	Unasyn	1.5–3 g IV every 6 hours	
Levofloxacin	Levaquin	500 mg orally once daily	
Moxifloxacin	Avelox	400 mg orally once daily	
Ceftriaxone	Rocephin	1–2 g IV every 12–24 hours	
Cefotaxime	Claforan	2 g IV every 4–6 hours	

See Chapter 135, Upper Respiratory Tract Infections, authored by Grace C. Lee for a more detailed discussion of this topic.

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